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APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
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EXAMINER	
REMAND, H	
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This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

OFFICE ACTION SUMMARY

☒ Responsive to communication(s) filed on 3/23/98

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 D.C. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire _____ ~~month(s), or~~ thirty days, ~~whichever is longer~~, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 4-7, 23 - 49 is/are pending in the application.
Of the above, claim(s) _____ is/are withdrawn from consideration.
☐ Claim(s) _____ is/are allowed.
☐ Claim(s) _____ is/are rejected.
☐ Claim(s) _____ is/are objected to.
☒ Claim(s) 4-7, 23-49 are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
☐ The specification is objected to by the Examiner.
☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.
☐ received in Application No. (Series Code/Serial Number) _____.
☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of Reference Cited, PTO-892
☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
☐ Interview Summary, PTO-413
☐ Notice of Draftperson's Patent Drawing Review, PTO-948
☐ Notice of Informal Patent Application, PTO-152

--SEE OFFICE ACTION ON THE FOLLOWING PAGES--

★ U.S. GPO: 1996-421-632/40206

1. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure did not specifically refer to the subject matter of lines 35-39, 43-49, and 62-77 of claim 23; claim 35 and; lines 18-22, 26-32 and 45-59 of claim 37.

There is no support in the original disclosure for reciting in claims 23 and 37 that the "means delimiting a coolant descending path", by itself, introduces all of the coolant supplied to the coolant ascending path, into the coolant descending path (clearly, such is a function of the structure defining the coolant ascending path and the structure of the top portion of the first coolant passage, for example, whether or not such contains perforations or exit holes).

For the elected specie, the specification on page 14 lines 13-15 defines the "coolant descending path 26" as the annular path between the inner tube 20 and the outer tube 21.

Thus, according to the specification, tubes 20 and 21 and, only tubes 20 and 21, are the "means delimiting a coolant descending path".

Note that page 14 of the specification states that the coolant ascending path 25 and the coolant descending path 26, are

communicated with each other through inverting portion 27 at the upper end of the water rod.

Note lines 24-31 of said page 14 which state:

> "The cooling water ascending path 25 and the cooling water descending path 26 are communicated with each other through an inverting portion 27 formed at an upper end of the water rod 19. Thus, the water rod 19 contains therein a cooling water path of an inverted U-shape which consists of the cooling water ascending path 25, the cooling water descending path 26 and the inverting portion 27". (Underlining added).

Thus, since the specification states that it is inverting portion 27 which diverts the coolant leaving the ascending path, into the descending path, there is no support for the present limitation that it is instead, the "means delimiting the coolant descending path" (i.e. tubes 20 and 21) which directs or introduces all of the coolant supplied to the ascending path, into the descending path.

There is no support in the original disclosure for the specific claimed relationships between a cross-sectional area of the "second coolant passage" and, other coolant passages nor, is there any support in the original disclosure for the claimed relationship between the second coolant passage (or a cross-sectional area thereof) and the recited pressure differentials.

This is because there is no reference at all, in the specification, to the above referred to "second coolant passage".

Clearly, if the specification does not refer to said "second coolant passage, it logically follows that the specification also

does not refer to any relationship between a cross-sectional area of this "second coolant passage" and other coolant passages nor, does it refer to any such relationship as providing the pressure differentials.

In this same vein, there is no definition of the term a "cross-sectional area of the second coolant passage at least in an area of the second coolant passage immediately above the fuel rod holding portion".

Note in this respect that it has not been defined what a "cross-sectional area" and, an "area of the second coolant passage... portion" actually refers to. Note that one can arbitrarily define an area, which is smaller than the actual cross-sectional area of the whole passage.

Due to use of the terminology "at least in an area..." (see claim 23 line 37, claim 37 line 19) it appears that applicant is referring to a cross-sectional area that is less than the total cross-sectional area of the second coolant passage. However, it has not been defined as to exactly how much "less", it actually is.

Note in this respect that Fig. 7A does not clearly show third coolant passage 18 as being smaller than the cross-sectional area of the area immediately above the cross-hatched portion of grid 13 which holds fuel rod 11.

This can be seen by assuming for the sake of argument that the cross-hatched fuel rod holding portion and third coolant passage 18 are in the form of cylinders, the diameter of passage 18 is larger than the diameter of the cross-hatched fuel rod holding portion (note that one must also subtract out the area taken up by the small diameter end piece of the fuel rod 11, because the fuel rod holding portion is actually in the form of an annulus).

Accordingly, for the reasons set forth above, it is the examiner's position that there is no support in either the original disclosure or the drawings, for the following statement in each of claims 23 and 37:

> "each of the third coolant passages having a cross-sectional area smaller than a cross-sectional area of the second coolant passage at least in an area of the second coolant passage immediately above the fuel rod holding portion".

The same line of reasoning also applies to the subject matter concerning the cross-sectional area of the second coolant passage found in claims 23 and 37 (the paragraph beginning with the following phrase):

> "at least the cross-sectional area of each of the third coolant passages having a relation to that of the second coolant passage, to thereby provide the pressure differentials upon flow of coolant...".

An additional issue here however, is that there is also no indication in either the original specification or drawings, as

to which horizontal level along the vertical length of the fuel assembly, one is to measure or otherwise determine the cross-sectional area of the second cross passage, so as to determine the claimed relationship of this cross-section area, to the cross-sectional area of the other coolant passages, etc.

If one were to assume for instance that one is to take the cross-sectional area of the second coolant passage across the whole fuel assembly (note initially as pointed out above that this assumption is not supported by the original disclosure), original Fig. 7A clearly shows that this cross-sectional area will differ depending on the vertical level at which it is taken, i.e. the cross-sectional area of the second coolant passage immediately above lower grid 13 differs from the cross-sectional area immediately below the upper grid 12 and, from the cross-sectional areas measured at the horizontal levels of lead line 21 and, lead line 23.

Furthermore, said lines 62+ of claim 23 and lines 45+ of claim 37, refers to the cross-sectional area of each of the third coolant passages, to that of the second coolant passage.

While it might be argued that the total cross-sectional area of all of the third coolant passages (which is not the feature being claimed) would have a bearing on or, an effect on the resulting claimed pressure differentials, there is no indication

in the original disclosure of the effect thereon of a single third coolant passage.

Attention is directed to the case law of In re Donaldson, 29 USPQ 2d 1845. Note page 1850 thereof which states that if one employs means-plus-function language in a claim, one must set forth in the specification an adequate disclosure showing what is meant by that language.

For the reasons set forth above, it is the examiner's position that the specification does not set forth this necessary adequate disclosure.

Claim 35 recites an increase of the flow rate of the coolant from a beginning of one fuel cycle to an end of the one fuel cycle and then subsequently (i.e. after the end of the one fuel cycle) somehow going back into the one fuel cycle that has ended and increasing the flow rate at an end of the one fuel cycle. It is impossible to go back into time to get into the one fuel cycle that has already ended.

2. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are vague, indefinite and incomplete.

There is no definition of the term a "cross-sectional area of the second coolant passage at least in an area of the second

coolant passage immediately above the fuel rod holding portion". It has not been defined what a "cross-sectional area" and, an area of the second coolant passage.... portion" actually refers to. Note that one can arbitrarily define an area, which is smaller than the actual cross-sectional area of the whole passage. The metes and bounds of the claims are thus undefined.

Claims 23 and 37 are vague, indefinite, incomplete, misdescriptive and inaccurate in referring to the "means delimiting a coolant descending path" as itself, introducing all the coolant supplied into the coolant ascending path, into the coolant descending path (clearly, such is a function of the structure defining the coolant ascending path and of the structure of the top portion of the first coolant passage).

Said introducing of all of the coolant into the coolant descending path, might also be construed as a recitation of a function or result but, without a recitation of a specific means to carry out this function or result.

Note in this respect that claims which only recite a function or result but do not also recite any specific means, characteristics, etc., which will produce the stated functions or results, are rejectable under 35 USC 112 second paragraph as vague and indefinite (see In re Fuller, 1929 C.D. 172).

It is not seen how one can interpret the claims in light of the description in the specification when the specification does

not contain an adequate description or even any description, of the subject matter or claim limitations in question.

The examiner's position on this issue is considered supported by the case law of In re Donaldson, 29 USPQ 2d 1845. Note the first column on page 1850 which states:

"Although paragraph six statutorily provides that one may use means-plus-function language in a claim, one is still subject to the requirement that a claim "particularly point out and distinctly claim" the invention. Therefore, if one employs means-plus-function language in a claim, one must set forth in the specification an adequate disclosure showing what is meant by that language. If an applicant fails to set forth an adequate disclosure, the applicant has in effect failed to particularly point out and distinctly claim the invention as required by the second paragraph of section 112". (Underlining added).

Claim 35 is vague, indefinite, incomplete, misdescriptive and inaccurate because it is not possible to go back in time to increase the flow rate at an end of the one fuel cycle, after that one fuel cycle has already ended.

Claim 35 is also vague, indefinite and incomplete as to what all is meant by and is encompassed by the term "an end". Also, it is not clear how many "ends", the one fuel cycle can have.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patterson et al in view of either Kumpf or Matzner.

Patterson et al (note Fig. 1) show the claimed structure of a fuel assembly having a plurality of fuel rods 10 held between upper tie plate 12 and lower tie plate 6, a plurality of fuel spacers 16 and, at least one water rod 18.

Patterson et al in Fig. 4 show the water rod 18 having a coolant ascending path and a coolant descending path (forming applicants claimed" first coolant passage").

Said Fig. 4 of Patterson et al shows the coolant ascending path as having a coolant inlet port open in a region below the lower fuel rod supporting tie plate 6 and, the coolant descending path as having a coolant delivery port 30 arranged in a position higher than the lower fuel rod supporting tie plate 6.

Note that Fig. 1 of Patterson et al shows flow openings through the lower tie plate (fuel rod support grid) (applicants claimed "third coolant passages"). The total cross-sectional area of these flow openings will inherently be smaller than the cross-sectional area of the coolant flow path immediately above the fuel rod support grid.

Patterson et al (note Fig. 1) show a coolant passage formed outside of the at least one water rod and being provided among the fuel rods and between the at least one water rod and the fuel

rods, between the upper tie plate and the fuel rod holding portion, or, in other words, applicants claimed "second coolant passage".

The claims appear to differ over Patterson et al by referring to all of the coolant supplied to the coolant ascending path in the water rod, as being introduced into the coolant descending path of the water rod.

Patterson et al provide the coolant ascending path of their water rod, with intermediate exit holes 24 which allows some of the coolant entering the water rod, to exit before reaching the coolant descending path.

However, it is a known alternative in this water rod art, to not provide intermediate exit holes in the tube defining the coolant ascending path or, in other words, it was known to introduce all of the coolant supplied to the coolant ascending path, into the coolant descending path.

Evidence of this known alternative can be found for example in the showing of water rod 32 in Fig. 10 of Kumpf.

Kumpf (like Patterson et al) shows a water rod with a coolant ascending path and a coolant descending path wherein the coolant inlet port is open in a region below the lower fuel rod supporting tie plate and wherein the coolant outlet port is in a region higher than said tie plate (e.g. see said Fig. 10).

Thus, Kumpf's water rod has the same structural elements or components as the water rod of Patterson et al. Kumpf however, unlike Patterson et al, does not provide the coolant ascending path with intermediate exit holes.

Alternatively, this feature of all of the coolant supplied to the coolant ascending path in the water rod being introduced into the coolant descending path of the water rod, is also shown by Matzner.

Accordingly, it would have been prima facie obvious to have no openings in the tube defining the coolant ascending path in Patterson et al, in view of the teachings in either Kumpf or Matzner which shows such to be a known alternative.

Additionally, it would also have been prima facie obvious to have substituted the water rod of Kumpf for the water rod of Patterson et al as such is no more than a choice among known alternatives. Note in this respect that both Patterson et al and Kumpf each illustrate what the artisan would readily recognize as a water rod. The various uses of these water rods are conventionally known in the art.

Thus the artisan would not ignore the teachings concerning a water rod in a second reference just because the reactor construction and operation may not be exactly identical to that of a first reference.

Further, the secondary reference, Kumpf, refers in various instances to "superheater" fuel elements or fuel rods (e.g. see col. 3 lines 5+ and 51+ and col. 4 lines 5+).

This reference to some of the fuel rods being "superheater" fuel rods would generally and conventionally imply to one of ordinary skill in the art, that the water coolant is caused to boil in a first pass through the reactor core (i.e. thus presenting a BWR or boiling water reactor) and the resulting steam-water mixture is then superheated by being sent back through different fuel elements or rods in the reactor core in the opposite direction.

Thus both the primary reference of Patterson et al and the secondary reference of Kumpf can be construed as teaching the use of a water rod in a BWR and, it is thus proper to utilize the teachings of Kumpf to modify the teachings of Patterson et al.

Independent claims 23 and 37 each have a paragraph starting with the words, "at least the cross-sectional area of each of the third coolant passages...", which refers to forming (during reactor operation) a state in which a void appears in the water rod and, during another state of reactor operation, operating the reactor so that no voids appear in the water rod (whereby the coolant flows through the coolant ascending and descending paths in substantially a single phase stream).

This statement in each of claims 23 and 37 is essentially a method of operation.

However, the present claims are apparatus claims. Even further, the independent claim 37 is directed to a single fuel assembly per se (such as a fuel assembly sitting on a shelf), rather than to a particular type of nuclear reactor having a reactor core formed of a plurality of fuel assemblies positioned in a pressure vessel, with coolant circulation pumps for circulating coolant therethrough, etc.

Thus, it is no necessary for the references to disclose applicants desired method of operation. The references need only disclose structure which is capable of being so operated.

Note that it is a conventionally known art expedient, that the amount of void in a water rod can be changed by changing the coolant flow rate.

Patterson et al as above modified, by either secondary reference, has the same structure as is recited in the claims. This structure is inherently capable of being operated in the recited manner. Note again that it is conventionally known in the art to change the amount of void in a water rod by changing the coolant flow rate. As indicated even in applicants specification itself, the formation of the void is dependent on the amount or rate of coolant flow produced by the circulation pump (which appears from applicants disclosure to be a

conventional circulation pump). Patterson et al refer to flowing coolant through the fuel assembly and this flow is conventionally obtained through use of a circulation pump. Such pumps are inherently capable of operation at different flow rates. Thus, the use of a circulation pump in Patterson et al which can operate at different flow rates and consequently produce different amounts of voids in the water rods (if not already inherent) would certainly be obvious because such is a conventionally known expedient in this art.

Claims such as claims 35 and 36 which refer broadly to a "means for controlling a flow rate of the coolant" supplied to the reactor core, read on such use of a circulation pump. Note also that Patterson et al as above modified, have the coolant inlet port and the coolant delivery port for the water rod, positioned the same as is recited in applicants claims, and, during reactor operation, pressure differentials will inherently be developed between these ports, dependent on coolant flow rate, the same as is recited in applicants claims.

Note that claims such as claims 4-7 and 31-34, merely set forth conventionally known expedients in the boiling water reactor art. The use of such expedient in Patterson et al would have been prima facie obvious because it would have resulted in no more than the use of conventionally known expedients.

Indeed, the secondary reference of Matzner clearly shows the feature of claims 5-7 and 32-34 to be old and conventional in the art and hence obvious.

5. Claims 4, 5, 31, 32 are rejected under 35 U.S.C. 103 as being unpatentable over Patterson et al in view of either Matzner or Kumpf as applied to claims 4-7, 23, 30-37 above, and further in view of any of Nelson et al, Japan 0050498 or Japan 0052999.

Claims such as claim 4 recite that the coolant ascending path in the water rod extends beyond the upper end of the fuel pellet-filled region of the fuel rods (which inherently means that the coolant descending path in the water rod must also extend beyond the upper end of the fuel pellet-filled region of the fuel rods). Claims such as claims 5 and 32 essentially recite a water rod as having a length less than that of the fuel rods. Such however, are conventionally known features in this art and to so modify the primary reference would have been prima facie obvious. This is especially so in view of the advantageous teachings of such in any of Nelson et al, Japan 0050498 or Japan 0052999 (note for example, figures 1 and 2 of Japan 0052999).

6. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 103 as being unpatentable over Patterson et al in view of either Matzner or Kumpf as applied to claims 4-7, 23, 30-37 above, and further in view of Japan 0220686 and Townsend.

Japan 0220686 shows a system similar to that of Patterson et al (note for example Fig. 6a of Japan 0220686). As indicated in the English language translation, the Japanese reference indicates the number of voids (or void fraction) in the water rod can be decreased to zero by increasing the coolant flow rate. Townsend (e.g. see columns 1, 3, 5 and Figures 1 and 2) shows a boiling water reactor with pumps for recirculating the coolant.

Accordingly, it would have been prima facie obvious to have provided for producing voids (and for changing the amount of voids (including down to zero percent voids)) in the water rod of the primary reference, as shown to be old and advantageous in the art by Japan 0020686.

It would also have been prima facie obvious to have utilized circulating pumps in Patterson et al for changing the amount of rate of coolant flowing through the core (and consequently the number or amount of voids formed in the water rods) as shown to be old and advantageous in the art by Townsend.

7. Claims 4, 5, 31, 32 are rejected under 35 U.S.C. 103 as being unpatentable over Patterson et al in view of either Matzner or Kumpf and any of Japan 0050498, Nelson et al or Japan 0052999 as applied to claims 4, 5, 31, 32 above, and further in view of Japan 0020686 and Townsend, for the reasons set forth above.

8. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matzner in view of either Patterson et al or Kumpf.

Matzner shows the claimed structure of a fuel assembly having a plurality of fuel rods R (which inherently contain fuel pellets) held between upper and lower tie plates (U, L), spacers and at least one water rod W (e.g. see Fig. 1 and cols. 1, 2, 3).

The water rod W has a coolant inlet 14 open in a region below the lower tie plate L. Water rod W has a coolant ascending path inside conduit 14 (which become standpipe 15) and, a coolant descending path in the annulus between pipes 15 and 18 with coolant delivery ports 20. The lower tie plate of Matzner will function as a "resistance member".

Claim 23 recites a means for controlling the amounts of voids in the water rods. As indicated even by applicants own specification, the formation of voids in the water rods is dependent on the amount or rate of coolant flow produced by the circulation pump. Matzner refers to flowing coolant thought the core by means of "conventional circulation pumps" (col. 3 lines 64+). Such pumps are inherently capable of operation at different flow rates. Thus, the use of a circulation pump which can operate at different flow rates and consequently produce different amounts of voids in the water rods is considered inherent in the teachings of Matzner.

As to limitations which are considered to be inherent in a reference, note the case law of In re Ludtke, 169 USPQ 563, In re Swinehart, 169 USPQ 226, In re Fitzgerald, 205 USPQ 594, In re Best et al 195 USPQ 430, and In re Brown, 173 USPQ 685, 688.

Claims 23 and 37 recite the water rod as being held by the fuel rod holding portion. While such may not be clearly shown in Matzner, such is inherent because it would reduce vibration and consequent wear, etc. In any event, this expedient is clearly taught by either secondary reference and to so modify Matzner would accordingly have been prima facie obvious.

Claims 23 and 37 refer to the fuel rod holding portion (lower tie plate) as having a plurality of third coolant passages. While Matzner may not clearly illustrate such in the drawings, such coolant passages are inherently present as evidenced for example by the statements in col. 3 of Matzner that the lower tie plate passes or permits the entry of water into the fuel assembly to flow along the fuel rods.

In any event, such coolant passages through the lower tie plate are clearly shown to be old and conventional in the art and hence obvious, by either Patterson et a (note for example Fig. 1 which shows flow openings through the lower tie plate) or Kumpf (note for example Figs. 1 and 2 which show flow openings through the lower tie plate).

As to claim 4, to have the coolant ascending path extending beyond the upper end of the fuel pellet-filled region, (and consequently, the coolant descending path extending beyond the upper end of the fuel pellet-filled region, as in claim 31), represents no more than a conventionally known alternative expedient in this art as evidenced for example by the teachings thereof in either secondary reference and to so modify Matzner would accordingly have been prima facie obvious.

Independent claims 23 and 37 each have a paragraph starting with the words, "at least the cross-sectional area of each of the third coolant passages...", which refers to forming (during reactor operation) a state in which a void appears in the water rod and, during another stage of reactor operation, operating the reactor so that no voids appear in the water rod (whereby the coolant flow through the coolant ascending and descending paths in substantially a single phase stream).

This statement in each of claims 23 and 37 is essentially a method of operation.

However, the claims here are apparatus claims. Even further, the independent claim 37 is directed to a single fuel assembly per se (such as a fuel assembly sitting on a shelf), rather then to a particular type of nuclear reactor having a reactor core formed of a plurality of fuel assemblies positioned

in a pressure vessel, with coolant circulation pumps for circulating coolant therethrough, etc.

Thus, it is not necessary for the references to disclose applicants desired method of operation. The references need only disclose structure which is capable of being so operated.

Note that it is a conventionally known art expedient, that the amount of void in a water rod can be changed by changing the coolant flow rate.

Matzner (at least as above modified), has the same structure as is recited in the claims. This structure is inherently capable of being operated in the recited manner. Note again that it is conventionally known in the art to change the amount of void in a water rod by changing the coolant flow rate. As indicated even in applicants specification itself, the formation of the void is dependent on the amount or rate of coolant flow produced by the circulation pump (which appears from applicants disclosure to be a conventional circulation pump). Matzner refers to flowing coolant through the fuel assembly and this flow is obtained through use of a circulation pump. Such pumps are inherently capable of operation at different flow rates. Thus, such use of a circulation pump in Matzner which can operate at different flow rates and consequently produced different amounts of voids in the water rods (if not already inherent) would

certainly be obvious because such is a conventionally known expedient in this art.

9. Claims 4, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matzner in view of either Patterson et al or Kumpf as applied to claims 4-7, 23, 30-37 above, and further in view of Nelson et al.

Claim 4 recites the coolant ascending path as extending beyond the upper end of the fuel pellet-filled region (and consequently, the coolant descending path as also extending beyond the upper end of the fuel pellet-filled region, as in claim 31).

Such however, represent no more than a conventionally known alternative construction, especially in view of the teachings in Fig. 7 of Nelson et al that to have the upper end of the water rod extend beyond the upper end of the fuel pellet-filled region is a known alternative to having the upper end of the water rod be below the upper end of the fuel pellet-filled region as in Fig. 1.

10. Claims 4-7, 23, 30-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matzner in view of either Patterson et al or Kumpf as applied to claims 4-7, 23, 30-37 above, and further in view of Japan 0220686.

Japan 0220686 shows a system similar to that of Matzner, (note for example Fig. 6a of Japan 0220686). As indicated in the

English language translation, the Japanese reference indicates the number of voids (or void fraction) in the water rod can be decreased to zero by increasing the coolant flow rate.

Accordingly, it would have been prima facie obvious to have provided for producing voids (and for changing the amount of voids (including down to zero percent voids)) in the water rod of Matzner as shown to be old and advantageous in the art by Japan 0220686.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication should be directed to Mr. Behrend at telephone number (703) 305-1831.

Behrend/gj-retyped/2

5-2-97

HARVEY E. BEHREND
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